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JC Bose patents radio wave detector, September 30, 1901

Jessica MacNeil -September 30, 2017

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James Clerk Maxwell's [equations](#) predicted the existence of electromagnetic waves of diverse wavelengths in the 1860s, and in 1888 Oliver Lodge and Heinrich Hertz verified it, along wires and in free space. After reading about their experiments, JC Bose, a professor of physics at Presidency College in Calcutta, India, reduced the waves to about 5mm to study them.

He developed the use of galena (lead sulfide) crystals contacted by a metal point for detecting millimeter electromagnetic waves, and filed patent 755840, for a "[Detector for electrical disturbances](#)" in 1901. It was the first device to use a semiconductor junction to detect radio waves.

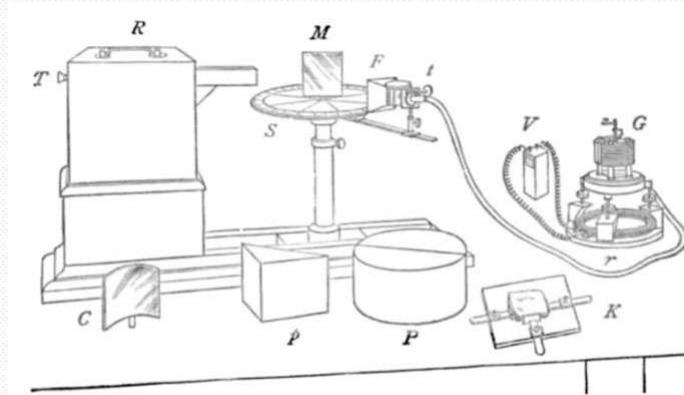
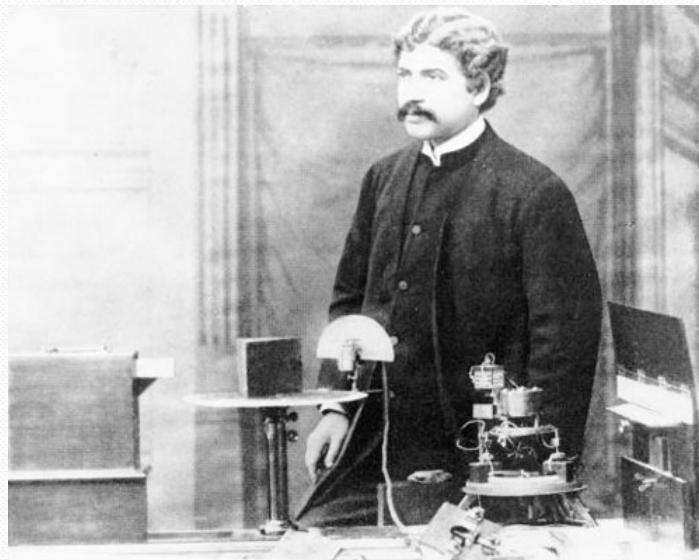
Bose created a portable device to study the optical properties of short waves, which incorporated the earliest waveguide and horn antenna. It would be more than 30 years before more research and analysis was done with the now widely-used horn antennas. His use of dielectric lenses, polarizers, prisms, and semiconductors at frequencies as high as 60 GHz, were also well ahead of his time.



Bose's 60-GHz microwave apparatus at the Bose Institute in Kolkata, India.

Source: Wikipedia user Gangulybiswarup

In a 1895 demonstration, he used electromagnetic waves to ignite gunpowder and ring a bell from a distance, reported to be nearly a mile. In 1897 Bose presented his microwave experiments at the Royal Institution in London (see the photo and diagram below).



R, radiator ; S, spectrometer-circle ; M, plane mirror ; C, cylindrical mirror ; P, totally reflecting prism ; P, semi-cylinders ; K, crystal-holder ; F, collecting funnel attached to the spiral spring receiver ; t, tangent screw, by which the receiver is rotated ; V, voltaic cell ; r, circular rheostat ; G, galvanometer.

He founded the Bose Institute in 1917 in Calcutta where some of his original instruments and devices are displayed. Bose spent much of his later career studying the effects of electromagnetic radiation on plants.

Much of Bose's component technology would eventually be used to develop microwave radio transmission. For his pioneering work in quasi-optic millimeter wave research, IEEE has called him the father of radio science. According to a 1997 *Microwave Symposium Digest* publication, "He developed an elegant millimeter wave spark transmitter, self recovering coherer detector, wire grid polarizer, cylindrical diffraction grating, dielectric lens and prism, rectangular waveguide, horn antenna and microwave absorber, for the studies of reflection, refraction, absorption and polarization of millimeter waves and its application to wireless remote control for firing a gun."

References

1. [The work of Jagadis Chandra Bose: 100 years of mm-wave research](#)
2. [Semiconductor Rectifiers Patented as "Cat's Whisker" Detectors](#), Computer History Museum

Also see:

- [Popov demonstrates radio receiver, May 7, 1895](#)
- [Tesla gives 1st public demonstration of radio, March 1, 1893](#)
- [Teardown: Maxwell's equations](#)

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Editor's note: This article was originally posted on September 30, 2013 and edited on September 30, 2017.



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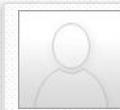
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Jiri Polivka

J.C.Bose was really a wonderful genius! He was ahead of time with most of his ideas.

The sad part is that he worked in India, then a British colony. This fact caused that his wonderful work was "out of sight" in Europe and the U.S. Then most of his ideas if ever found were stolen and copied. Others gained money while he used his modest wealth to establish the first college in India where math and physics were taught.

Oct 1, 2015 2:49 AM EDT

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